

By this amendment, claims 1, 8, and 12 have been amended. No claims have been canceled. Hence, claims 1-28 are pending in the Application.

SUMMARY OF REJECTIONS/OBJECTIONS

Claim 1 is rejected under 35 USC 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 is rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 - 5 and 12 – 19 and 26 – 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harumi A. Kuno and Elke A Rundersteiner, "Using Object-Oriented Principles to Optimize Update Propagation to Materialized Views", herein Harumi, in view of U.S. Patent No. 5,991,754, herein Raitto.

Claims 6 – 9 and 20 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harumi in view Raitto, and in further view of U.S. Patent No. 6,272,502, referred to in the Office Action as Lieuwen.

Rejection of Claim 1 Under 35 USC 101

The alleged basis of the rejection is that claim 1 recites a database management system performing an operation on said objects as instances of said object class, which does not provide a concrete and tangible result. Thus, claim 1 is rejected on the ground that one limitation of claim 1 does not allegedly produce a concrete tangible result. This rejection is traversed. The rejection is improper for at least several reasons.

First, the rejection is based on the results of one limitation and not the claim as whole. The law, (see Interim Guidelines for Examination of Patent Applications) clearly requires that the claim be considered as whole. No attempt was made to do so here.

Second, a database system performing an operation on said objects as instances of said object class is a useful and tangible result. Computers performing operations on instances of object classes represents a fundamental advance in computer technology. Any computer science major whose taken an introductory computer course knows this.

Based on the foregoing, claim 1 is patentable subject matter under 35 USC 101. Reconsideration and removal of the rejection is respectfully requested.

Rejection of Claim 1 Under 35 USC 112

Claim 1 is rejected under 35 USC 112, second paragraph because the method allegedly comprises an apparatus. However, this is incorrect. Claim 1 comprises a method with steps that are limited to being performed by a database system. Such a limitation is clear and definite as a way of performing a process to one skilled in the art.

Claim 1 is also rejected under 35 USC 112, second paragraph, because allegedly the "limitation of 'said database management system performing operations on said objects as instances of said object class' is not related to other limitations'." Applicant disagrees that claim 1, before amendment, did not relate this limitation to the remainder of claim 1. However, this issue is moot because the amendments to claim 1 clearly relate to this limitation.

Claim 1

Claim 1 as amended, recites:

a database management system receiving a request to generate a materialized
view that contains objects of an object class;...

wherein attribute values of an object contained in said materialized view are
derived from one or more base tables;

wherein the step of creating said materialized view includes creating
a container table, separate from said one or more base tables,

that includes corresponding columns that correspond to said attributes and that hold the attribute values of said attributes;
and
storing said attribute values of said attributes in said container table.

To reject claim 1 under obviousness, correlations must be made between elements of claim 1 and those taught by Harumi. Based on the Office Action, these correlations must include a correlation between a materialized view as claimed and the materialized virtual class of Harumi, between the base data of a materialized view as claimed and the objects in a source class of a materialized virtual class, and between objects contained in a materialized view as claimed and the objects belonging to the materialized virtual class (i.e. a virtual class extent).

Even if these correlations are valid, Claim1 differs fundamentally from Harumi. A fundamental difference lies in the way a materialized view is materialized under claim 1 and a materialized virtual class is materialized under Harumi. Claim 1 requires storing attribute values of an object contained in a materialized view separately from base data from which the attribute values are derived. The attributes values of an object contained in a materialized view are stored in a container table; base data from which the attribute values are derived are stored in a base table.

Harumi describes a different form of materialization, referred to as membership materialization.

We define a materialized virtual class as a virtual class that caches its extent rather than computing it upon access. **We do not replicate objects that belong to materialized virtual classes, but instead store references to them.** We refer to this feature as **membership materialization**. As it depends upon oid support, membership materialization is unique to the object-oriented model. This feature reduces the storage overhead of materialization as well as the time and effort required for view update propagation (**demonstrated in Sections 4 and 5**). (emphasis added)

Under membership materialization, the objects belonging to a materialized virtual class are not stored separately from those of the source class. Rather, only references to those objects in source class are stored. There is no separate storage of the objects of the source class in container table or other structure created for the materialized view.

No Motivation to Modify Harumi to Combine with Raitto

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143

To support the rejection under obviousness, Harumi must be modified to support the sort of materialization required by claim 1, not the membership materialization taught by Harumi. In the present application, there is no suggestion or motivation to modify Harumi to perform the sort of materialization required by claim 1 instead of the membership materialization taught by Harumi.

The MPEP states, “[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP §2143.01 citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Modifying Harumi to support of an obvious rejection requires modifying Harumi in a way that violates a principle of fundamental operation.

Under membership materialization, an object that belongs to a materialized virtual class is not stored separately from a source class, i.e. is not replicated. Thus, the object and its attribute values are not stored in a separate container table or other data structure created for the materialized view. Rather, only references to the objects of the source class are stored!

Harumi further teaches membership materialization is fundamental to reducing storage overhead and time and effort for updating a view. Haruma expressly dedicates a large portion of itself, i.e. sections 4 and 5, to demonstrating that the principle achieves these benefits. Even the title of Harumi expressly recites the notion of optimizing update propagation to materialized views.

To modify Harumi to support an obviousness rejection, it must be modified by creating a separate container table or other data structure for a materialized virtual class and using it to store attribute values of the objects contained in the materialized virtual class. This would however violate membership materialization because object and object attribute values are being stored and replicated for the materialized virtual class rather than just storing references to the source objects. Thus a fundamental principle of operation of Harumi is violated – one that is fundamental to achieving the very benefits for which Harumi was entitled.

Claim 12

a base table ... includes a base column typed as an object reference; and
wherein the step of creating said materialized view includes creating a particular
column of said container table that:
corresponds to said base column, and

is typed as an object reference.

Claim 12 thus requires creating a column in a container table typed as an object reference. The Office Action cites Raitto as teaching this feature at col. 2, lines 1 – 17 and col. 10, lines 51 – 61. These passages are as follows:

A materialized view, on the other hand, is a view for which a copy of the view data is stored separate from the base tables from which the data was originally gathered and derived. The data contained in a materialized view is referred to herein as ("materialized data"). Materialized views eliminate the overhead associated with gathering and deriving the view data every time a query accesses the view. As new data is periodically added to the base tables, the materialized view needs to be updated (i.e., refreshed) to reflect the new base data.

Materialized views that are derived from more than one base table are created by performing a join between the base tables. A join is a query that combines rows from two or more tables, views, or materialized views. A join is performed whenever multiple tables appear in a query's FROM clause. The query's select list can select any columns from any of the base tables listed in the FROM clause. (col. 2, lines 2 – 17)

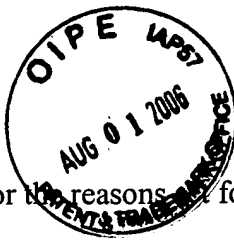
Various criteria may be used during this pruning process. For example, one possible pruning criteria may be that at least one of the tables referenced in the received query must be a base table of the materialized view. Based on this criteria, a materialized view that has base tables A, B, and C would qualify as a "possible materialized view" with respect to a query that requires a join between tables A and D. On the other hand, a materialized view that has base tables B, C and E would not qualify as a "possible materialized view" with respect to a query that requires a join between tables A and D. (col. 10, lines 51 – 61)

These passages teach about various topics. Among the teachings are that data for materialized views is stored separately from the base tables, and that materialized views may be derived from query joins of base tables. Also taught is a process of pruning

materialized views from a candidate set of materialized views that may be used for query rewrite. Nothing about these passages teaches about creating a column in a container table typed as an object reference.

Remaining Pending Claims

The pending claims not discussed so far are dependant claims that depend on an independent claim that is discussed above. Because each of the dependant claims include the limitations of claims upon which they depend, the dependant claims are patentable for at least those reasons the claims upon which the dependant claims depend are patentable. Removal of the rejections with respect to the dependant claims and allowance of the dependant claims is respectfully requested. In addition, the dependent claims introduce additional limitations that independently render them patentable. Due to the fundamental difference already identified, a separate discussion of those limitations is not included at this time.



For the reasons set forth above, Applicant respectfully submits that all pending claims are patentable over the art of record, including the art cited but not applied.

Accordingly, allowance of all claims is hereby respectfully solicited.

The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

on July 27, 2006

by

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